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 IDENTIFIERS *Alternating Current: Mountain Plains Program

ABSTRACT

One of four individualized courses included in a radio and television repair curriculum, this course focuses on alternating current relationships and computations, transformers, power supplies, series and parallel resistive-reactive circuits, and series and parallel resonance. The course is comprised of eight units: (1) Introduction to Alternating Current, (2) Alternating Current Relationships, (3) The Transformer, (4) Power Supplies, (5) Alternating Current Computations, (6) Series Resistive-Reactive Circuits, (7) Series Resonance, and (8) Parallel Resistive-Reactive Circuits. Each unit begins with a Unit Learning Experience Guide that gives directions for unit completion. The remainder of each unit consists of Learning Activity Packages (LAP) that provide specific information for completion of a learning activity. Each LAP is comprised of the following parts: objective, evaluation procedure, resources, procedure, supplemental sheets, study guide, and a LAP test with answers. The course is preceded by a pretest which is designed to direct the student to units and performance activities. (LRA)

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MOUNTAIN PLAINS LEARNING EXPERIENCE GUIDE:

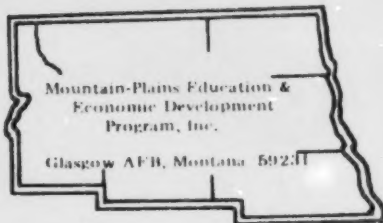
Radio and T.V. Repair.

Course: A.C. Circuits.

CE 027 818

U.S. DEPARTMENT OF HEALTH,
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Learning Experience Guide

COURSE: A.C. CIRCUITS

DESCRIPTION:

Alternating current (AC) circuits deals with basic concepts and applications related to simple and complex circuits. Topics emphasized are AC relationships and computations, transformers, power supplies, series and parallel resistive-reactive circuits, and series and parallel resonance.

RATIONALE:

The AC circuits course will provide you with extensive theory. This theory will enable you to understand electrical AC relationships and to work effectively as a service person.

OBJECTIVES:

Given a student handbook and unit booklets, you will complete workbook exercises about alternating current (AC) circuits that enables you to:

1. use mathematics to describe electronic properties of circuits.
2. identify circuit purpose.
3. explain operational characteristics of circuits.

PREREQUISITES:

Course: D.C. CIRCUITS

RESOURCES:

A resource list is attached.

GENERAL INSTRUCTIONS:

This course has eight units. Each unit has a Unit Learning Experience Guide (LEG) that gives directions for unit completion. Each unit consists of Learning Activity Packages (LAPs) that provide specific information for completion of a learning activity. Pretesting results direct the student to units and performance activities.

The general procedure for this course is as follows:

1. Read the assigned unit LEG for this course.
2. Begin and complete the first assigned LAP.

3. Proceed to the next assigned LAP in the unit.
4. Complete all required LAPs for the unit by following steps 2 through 4.
5. Take the unit tests as described in the Unit LEG "Evaluation Procedures".
6. Proceed to the next assigned unit in this course.
7. Follow steps 1 through 7 for all required units for this course.
8. Proceed to the next assigned course.

You will work independently unless directed to do otherwise. When questions or problems arise, you are expected to discuss them with the instructor. At all times remember to follow correct safety procedures during the performance activity.

UNIT TITLES:

- .01 Introduction to A.C.
- .02 A.C. Relationships
- .03 The Transformer
- .04 Power Supplies
- .05 A.C. Computations
- .06 Series Resistive-Reactive Circuits
- .07 Series Resonance
- .08 Parallel Resistive-Reactive Circuits

EVALUATION PROCEDURE:

Course evaluation of the student is by pre and post testing using a multiple-choice type of test.

In this course, the course test is used as a pretest to determine which units, if any, the student may be able to validate. For each unit on the course pretest that the student correctly completes 4 out of 5 items, for each LAP part, the student is considered validated.

The course test will also be taken by the student as a post test to determine any changes resulting from taking all or part of the course.

FOLLOW-THROUGH:

After reading this Course LEG, you are ready to move on to the Learning Experience Guide (LEG) for the first unit. Read the LEG carefully and follow directions given in it. If you have a question, consult with your instructor.

AC Circuits 77.02

Printed Materials

1. AC Circuits, An Individualized Approach to Electronics, (set of eight unit booklets, student handbook, and progress tests). Paul E. Trejo, Westinghouse Learning Corporation, New York, New York, 1972.

Audio/Visuals

none

Equipment

none

9/10/75

COURSE TEST ANSWER SHEET

Occupational Area:

File Code:

Name:

Family Pay Number

PRE & POST

77.02.00.00 A2-2

Sex M F (Circle 1)

ANSWERS

77.02.01.01

1. B

2. B

3. A

4. D

02

5. D

6. B

7. C

8. A

9. A

10. B

77.02.02.01

11. C

12. B

13. D

14. C

15. A

02

16. A

17. C

18. B

19. B

20. B

03

21. C

22. B

23. B

24. C

04

25. D

26. C

27. D

28. D

29. B

05

30. C

31. C

32. B

33. B

34. C

35. A

77.02.03.01

36. A

37. C

38. B

39. D

40. C

02

41. B

42. C

43. C

44. B

03

45. D

46. D

47. A

48. D

49. C

04

50. C

51. C

52. D

53. A

54. B

55. A

77.02.04.01

56. A

57. B

58. D

59. A

60. C

COURSE TEST ANSWER SHEET

Occupational Area:

File Code:

Name:

PRE & POST77.02.00.00 A2-2ANSWERS

02	61.B _____	02	81. B _____	02	101.D _____
	62.B _____		82. A _____		102.B _____
	63.D _____		83. A _____		103.A _____
	64.B _____		84. A _____		104.C _____
77.02.05.01	65. A _____		85. D _____	77.02.08.01	105.B _____
	66.D _____	03	86. A _____		106.D _____
	67.A _____		87. C _____		107.A _____
	68.D _____		88. B _____		108.C _____
	69.B _____		89. C _____		109.B _____
	70.C _____		90. C _____	02	110.D _____
02	71.A _____	04	91. A _____		111.B _____
	72.D _____		92. B _____		112.D _____
	73.B _____		93. B _____		113.D _____
	74.A _____		94. D _____		114.B _____
	75.A _____		95. D _____		115.D _____
77.02.06.01	76.B _____	77.02.07.01	96. A _____	03	116.A _____
	77.C _____		97. C _____		117.A _____
	78.C _____		98. B _____		118.A _____
	79.B _____		99. A _____		119.D _____
	80.A _____		100. C _____		120.A _____

COURSE TEST ANSWER SHEET

Occupational Area:

File Code:

Name:

PRE & POST77.02.00.00 A2-2ANSWERS

04

121. A _____

141. _____

161. _____

122. C _____

142. _____

162. _____

123. B _____

143. _____

163. _____

124. A _____

144. _____

164. _____

125. A _____

145. _____

165. _____

05

126. D _____

146. _____

166. _____

127. A _____

147. _____

167. _____

128. D _____

148. _____

168. _____

129. D _____

149. _____

169. _____

130. C _____

150. _____

170. _____

131. _____

151. _____

171. _____

132. _____

152. _____

172. _____

133. _____

153. _____

173. _____

134. _____

154. _____

174. _____

135. _____

155. _____

175. _____

136. _____

156. _____

176. _____

137. _____

157. _____

177. _____

138. _____

158. _____

178. _____

139. _____

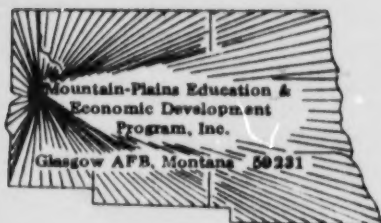
159. _____

179. _____

140. _____

160. _____

180. _____



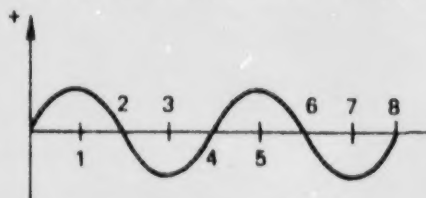
Student: _____ File Code: 77.02.00.00.A2-2
 Date: _____ Date Published: 5-24-74

COURSE POST TEST: A.C. CIRCUITS

77.02.01.01

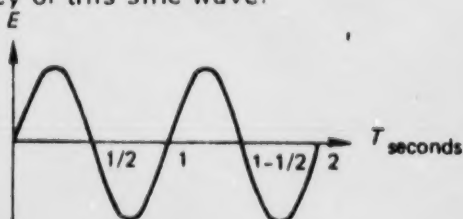
1. For the sine wave shown, how much time is required to complete one cycle?

- a. 8 seconds
- b. 4 seconds
- c. 2 seconds
- d. 6 seconds



2. What is the frequency of this sine wave?

- a. $\frac{1}{2}$ Hz
- b. 1 Hz
- c. 1 second
- d. 2 Hz



3. If the time required to complete one cycle is 1 msec., the frequency is:

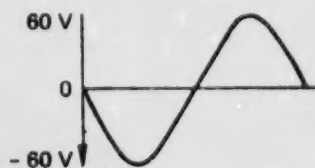
- a. 1000 Hz
- b. 100 Hz
- c. 10 Hz
- d. 10,000 Hz

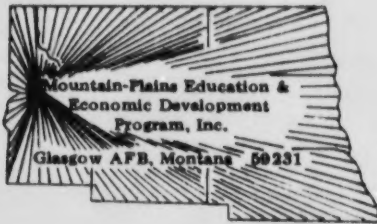
4. Most ac meters are calibrated in:

- a. amplitude values
- b. average values
- c. peak-to-peak values
- d. effective values

5. What is the peak-to-peak value of the sine wave shown?

- a. 20 V
- b. 60 V
- c. 0 V
- d. 120 V





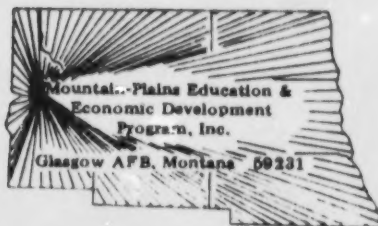
77.02.01.02

6. Another name for an ac generator is:
 - a. a stator
 - b. an alternator
 - c. a commutator
 - d. a rotor

7. The brushes that carry current from the slip rings to the outside circuit are usually made of:
 - a. copper
 - b. lead
 - c. carbon
 - d. zinc

8. A generator is a device used to convert mechanical energy into:
 - a. electrical energy
 - b. potential energy
 - c. inductive energy
 - d. magnetic energy

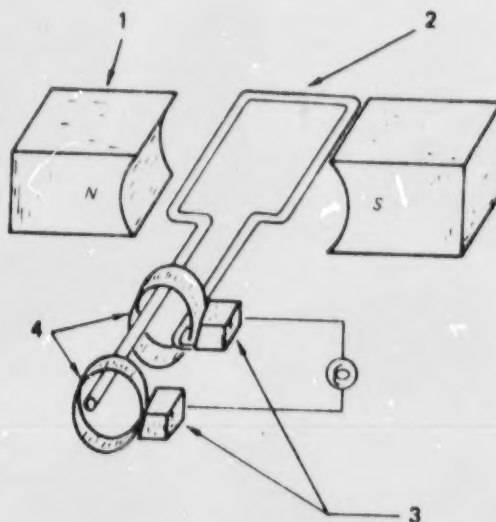
9. Which of the following statements pertains to AC?
 - a. generated by magnetic mechanical action
 - b. electrons moving in one direction
 - c. can be generated by chemical action
 - d. electrons moving at a constant rate



77.02.01.02 (Continued)

10. Using the illustration provided, which of the following numbered items are the brushes:

- a. 1
- b. 3
- c. 2
- d. 4



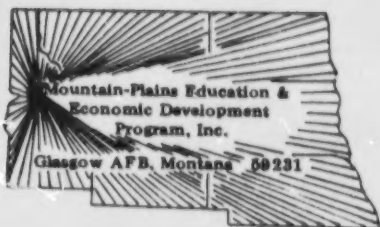
77.02.02.01

11. The numerical value of 2 is 6.28. Which of these equations that include the numerical value of 2 is correct for determining X_L ?

- a. $\frac{1}{6.28FL}$
- b. $6.28 \times \frac{F}{L}$
- c. $6.28FL$
- d. $\frac{6.28}{FL}$

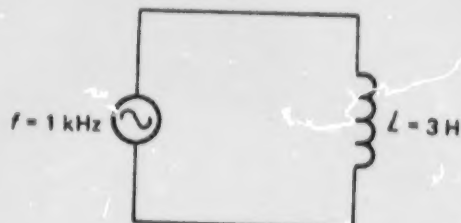
12. What would be the value of X_L if the frequency were 60 Hz and the inductance 100 mH?

- a. 26.5 ohms
- b. 37.7 ohms
- c. 3.77 ohms
- d. 2.65 ohms

77.02.02.01 (Continued)

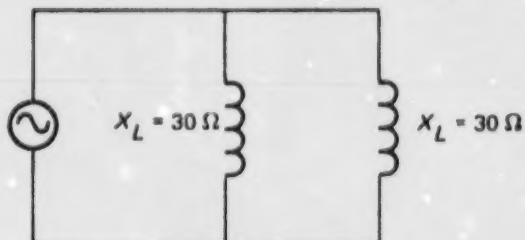
13. Using the illustration below, solve for X_L :

- a. 1884 ohms
- b. 18.84 ohms
- c. 188.4 ohms
- d. 18,840 ohms



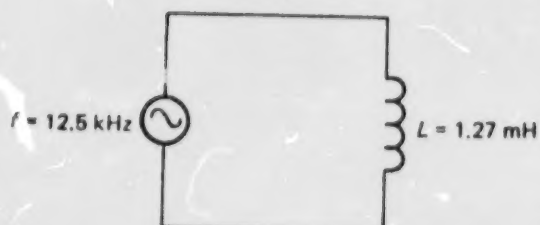
14. By using the information provided below, solve for total X_L :

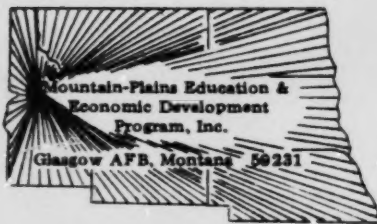
- a. 10 ohms
- b. 60 ohms
- c. 15 ohms
- d. 900 ohms



15. Solve for X_L :

- a. 99.7 ohms
- b. 9.9 ohms
- c. 999 ohms
- d. 9970 ohms

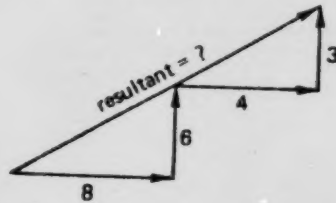




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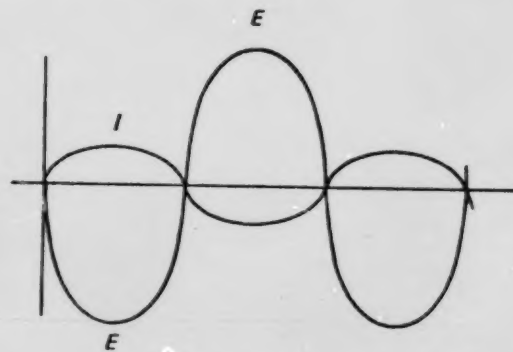
16. What is the vector sum (resultant) of the vectors shown?

- a. 15
- b. 11
- c. 10
- d. 21



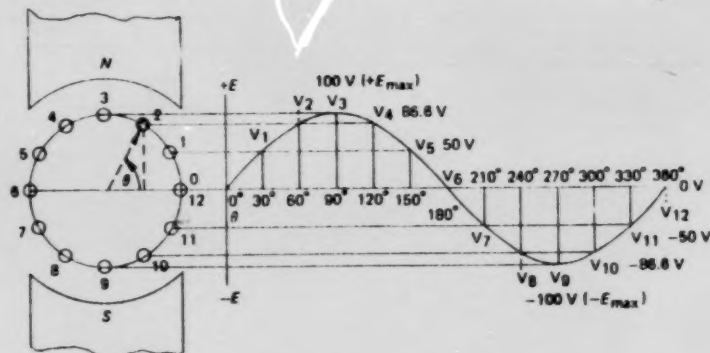
17. In the figure below,

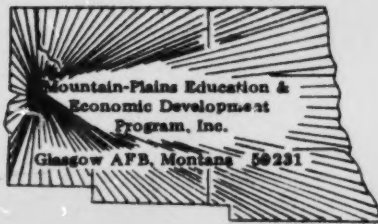
- a. 1 leads E by 90°
- b. 1 lags E by 180°
- c. 1 leads E by 180°
- d. 1 leads E by 120°



18. What is the angle of the vector in the drawing below?

- a. 30°
- b. 60°
- c. 120°
- d. 150°

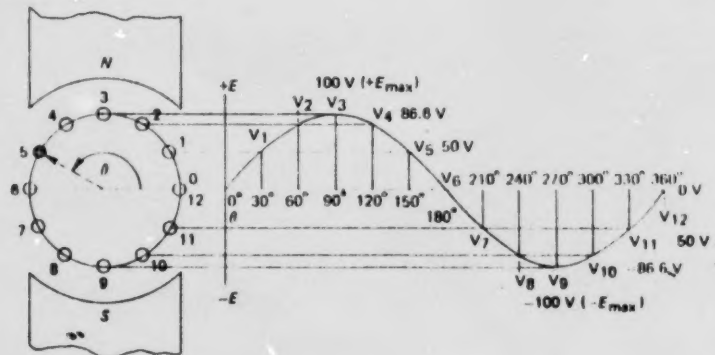




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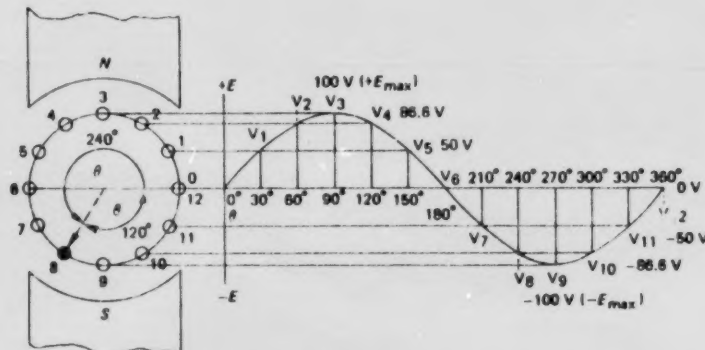
19. What is the angle of the vector as shown below?

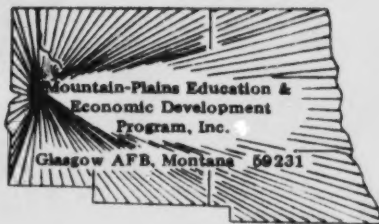
- a. 30°
- b. 150°
- c. 210°
- d. 230°



20. In the figure below, the vector has rotated 240° . Reading the angle clockwise from the baseline, we see that the lag in degrees is:

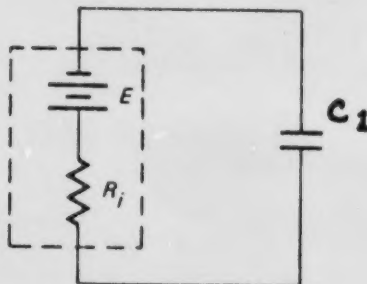
- a. 60°
- b. 120°
- c. 240°
- d. 180°



77.02.02.03

21. Check the statement that are true for the circuit shown. While the capacitor is charging or discharging,

- a. the terminal voltage does not change
- b. a voltage is developed across C_1
- c. the capacitor voltage does not equal E
- d. the value of the resistor changes



22. A capacitor

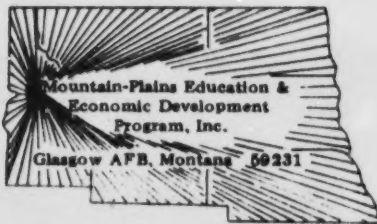
- a. blocks AC
- b. acts as an open in a DC circuit when fully charged
- c. blocks a steady flow of AC
- d. acts as a short in a DC circuit when fully charged

23. Since capacitive reactance is inversely proportional to frequency, when frequency is decreased,

- a. X_C decreases
- b. X_C increases
- c. X_C stays the same
- d. C increases

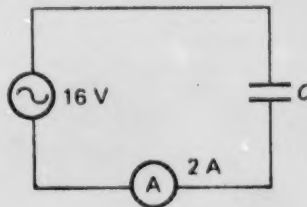
24. If capacitance is increased,

- a. X_C will stay the same
- b. X_C will increase
- c. X_C will decrease
- d. X_C will go to zero

77.02.02.03 (Continued)

25. Calculate X_C in the circuit shown?

- a. 18 ohms
- b. 32 ohms
- c. 1.25 ohms
- d. 8 ohms

77.02.02.04

26. R_T is equal to the sum of the resistances and, according to Kirchhoff's voltage law, E is equal to the :

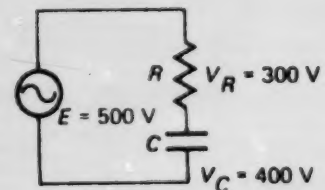
- a. voltage drop
- b. difference between the voltage drops
- c. sum of the voltage drops
- d. current + voltage

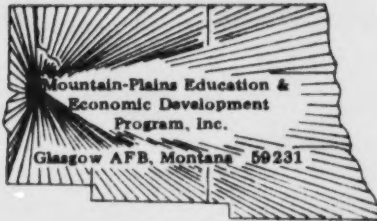
27. When vectors are used to describe a series circuit, which common circuit value listed below is used as the reference?

- a. time
- b. resistance
- c. voltage
- d. current

28. In the circuit shown, the combination of out-of-phase voltages V_C and V_R is greater than either individual value

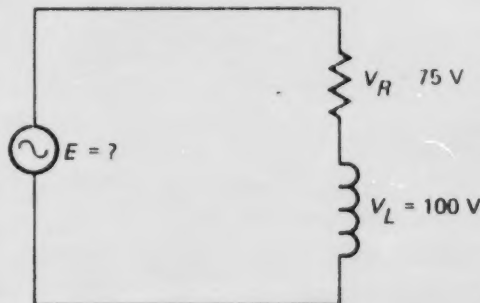
- a. and the same of the direct sum of the two
- b. and greater than the direct sum of the two
- c. and equal to the direct sum of the two
- d. but less than the direct sum of the two



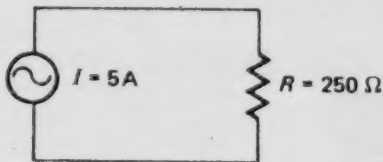
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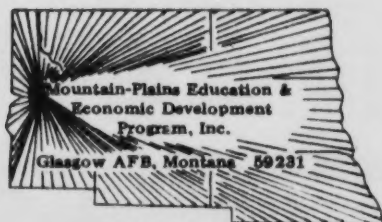
29. If a circuit is resistive and reactive, the impedance is a special combination of R and X. Regardless of the type of circuit, the correct term for total opposition to alternating current is :
- a. reactance
 - b. impedance
 - c. resistance
 - d. wattage
30. What is the total voltage in the circuit shown ?

- a. 47.2 V
- b. 50 V
- c. 125 V
- d. 12 V

77.02.02.05

31. Since power is the conversion of energy from one form to another, how many watts would be converted to heat in the circuit shown?
- a. 62.5 W
 - b. 625 W
 - c. 6,250 W
 - d. 62,500 W

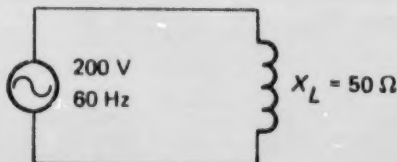




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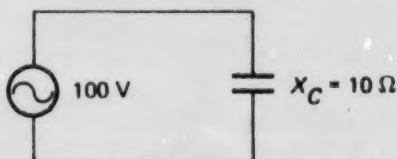
32. Determine the value of P_x for the circuit shown, using the formula $P_x = I^2 X_L$:

- a. 0.8 VAR
- b. 800 VAR
- c. 80 VAR
- d. 8,000 VAR



33. In the purely capacitive circuit shown, what is the reactive power?

- a. 1 VAR
- b. 1000 VAR
- c. 10 VAR
- d. 100 VAR

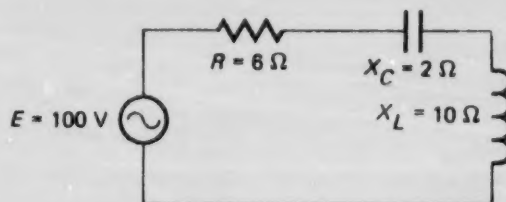


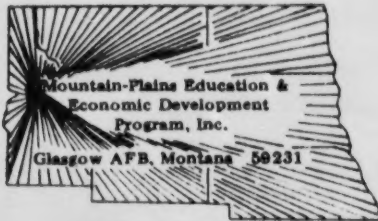
34. In a circuit containing "only inductance", apparent power (P_a) is equal to reactive power (P_x). Which formula can be used to solve for P_a or P_x in an inductive circuit?

- a. $P_a = E_L I^2$
- b. $P_a = I^2 R$
- c. $P_a = I^2 X_L$
- d. $P_a = I^2 X_C$

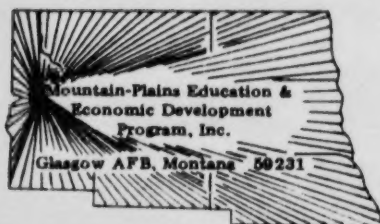
35. Given the circuit below, solve for Z:

- a. 10 ohms
- b. 20 ohms
- c. .1 ohms
- d. 100 ohms



77.02.03.01

36. Transformers are useful in AC circuits because:
- a. electromagnetic induction depends on a changing magnetic field
 - b. DC voltages are too high
 - c. no magnetic field is associated with direct current
 - d. a DC transformer is too large to be practical
37. "Which statement is true about an iron core transformer?"
- a. the primary winding is not separated from the secondary winding by air space
 - b. the primary winding is not separated from the secondary winding by insulating material
 - c. the coefficient of coupling is greater than in an air core
 - d. coils are wound side by side
38. Which type of transformer is the most efficient?
- a. hollow core
 - b. shell type
 - c. open core
 - d. paper core
39. A power supply that operates on a frequency of 60 Hz has a core of:
- a. copper
 - b. air
 - c. cardboard
 - d. iron
40. The terms "step-up" and "step-down" refer to transformer:
- a. power
 - b. current
 - c. voltage
 - d. resistance

77.02.03.02

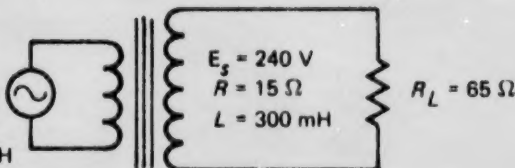
41. Exciting current flows in the primary in a no-load condition; it supports the magnetic field around the coil, and a small part of it overcomes the resistance of the:

a. core
 b. winding
 c. secondary
 d. load

42. What is the exciting current in this circuit? (Since R_L is much larger than R , ignore R)

a. 0.8 A
 b. 12 A
 c. 1.2 A
 d. 8 A

$E = 120$
 $f = 60 \text{ Hz}$
 $R = 1.0 \Omega$
 $L = 265 \text{ mH}$

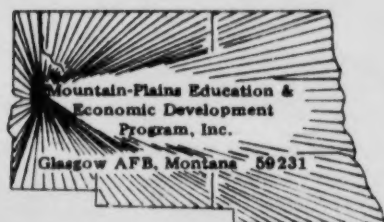


43. The cemf and applied voltage in a transformer primary are how many degrees out of phase?

a. +45
 b. -45
 c. +180
 d. -90

44. In most transformers, the secondary is wound directly on top of the primary to:

a. conserve space
 b. increase coefficient of coupling between coils
 c. work at high voltages
 d. work at low voltages

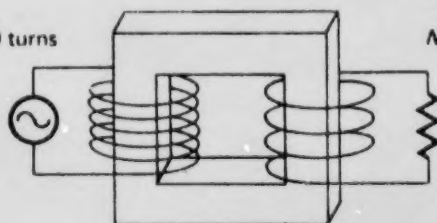
77.02.03.02 (Continued)

45. If there are more turns in the primary than in the secondary, the transformer is a:
- step-over transformer
 - step-up transformer
 - no step transformer
 - step-down transformer

77.02.03.03

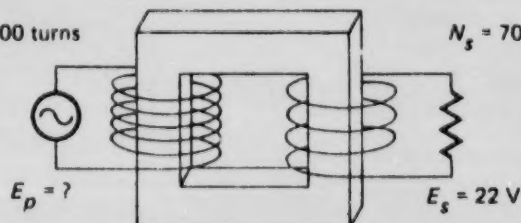
46. In the transformer shown, the turns ratio of primary to secondary is:

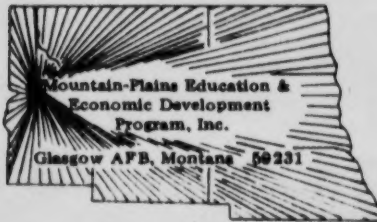
- 4:1
- 1:2
- 1:4
- 2:1

 $N_p = 1000$ turns $N_s = 500$ turns

47. An equality between two ratios can be expressed as a statement of:
- proportionality
 - divergence
 - convergence
 - disproportionality
48. In the circuit shown, if the secondary voltage is 22 V, the primary voltage must be:

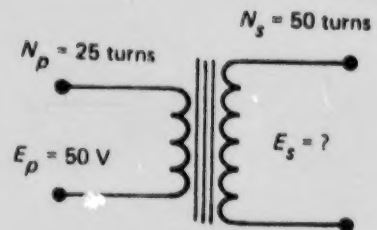
- 6.6 V
- 7.3 V
- 73 V
- 66 V

 $N_p = 2100$ turns $N_s = 700$ turns $E_p = ?$ $E_s = 22$ V

77.02.03.03 (Continued)

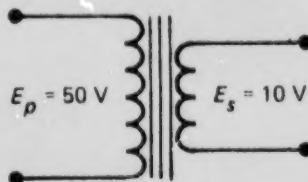
49. In this circuit, what is the secondary voltage?

- a. 2.5 V
- b. 25 V
- c. 100 V
- d. 10 V



50. What is the turns ratio in the circuit below?

- a. 50:1
- b. 1:5
- c. 5:1
- d. 1:50

77.02.03.04

51. A transformer has a 60 VA primary and a 55 W secondary. What is the efficiency percentage of this transformer?

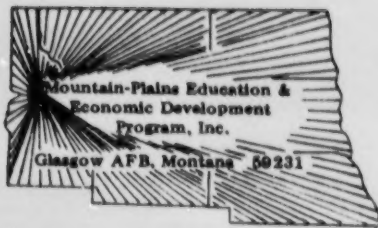
- a. 89.75%
- b. 119.43%
- c. 91.66%
- d. 96.19%

52. In a 1:40 step-up transformer, the wire in the secondary has:

- a. less windings than the primary
- b. a larger diameter than the primary
- c. the same diameter as the primary
- d. a smaller diameter than the primary

53. Circulating currents induced in a transformer core by the changing flux are called:

- a. eddy currents
- b. displacement currents
- c. circulating currents
- d. hysteresis currents

77.02.03.04 (Continued)

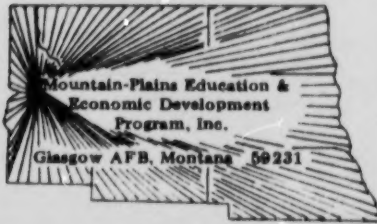
54. Lamination of the core material:
- decreases transformer efficiency
 - increases transformer efficiency
 - does not affect transformer efficiency
 - creates heat
55. Check the statement that is true of an autotransformer:
- near unity coupling
 - advantageous at high turns ratios
 - heavier and larger than other transformers
 - advantageous at unity turns ratio

77.02.04.01

56. The symbol for a semiconductor rectifying diode is:

a. _____	A	C
b. _____		
c. _____		
d. _____	B	D

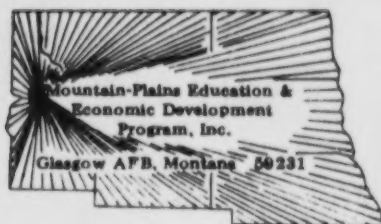
57. A diode placed in a circuit so that it permits current to flow through it is said to be:
- reverse biased
 - forward biased
 - passing biased
 - blocking biased
58. Up to a point, as the current through a semiconductor diode increases, the forward resistance:
- ends altogether
 - increases
 - remains the same
 - decreases

77.02.04.01 (Continued)

59. The forward voltage drop across a typical semiconductor diode varies from:
- a. 0 to 1 V
 - b. 1 to 10 V
 - c. 10 to 20 V
 - d. 25 to 30 V
60. The frequency of the pulsating DC from a rectifier output is the:
- a. output frequency
 - b. rectifier frequency
 - c. ripple frequency
 - d. filter frequency

77.02.04.02

61. In a pulsating DC wave, the peak value of the ripple voltage is 5 V and the maximum output voltage is 100 V. What is the minimum output voltage?
- a. 75 V
 - b. 90 V
 - c. 80 V
 - d. 86 V
62. Smoothing action provided by a capacitance filter depends on the:
- a. temperature
 - b. storage ability of the capacitor
 - c. excess energy
 - d. load
63. The major disadvantage of a simple inductance filter is:
- a. high output voltage
 - b. nearly constant current output
 - c. lower current output
 - d. lower voltage output

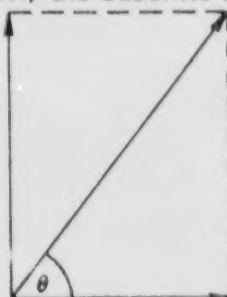
77.02.04.02 (Continued)

64. An application requiring a high value and steady current flow from the rectifiers to the load and requiring good voltage stability would use a (n):
- pi-section filter
 - L-section filter
 - simple capacitor
 - simple inductor
65. Which type of filter is sometimes substituted for a pi-section filter?
- resistance capacitor
 - simple capacitor
 - L-section
 - simple inductor

77.02.05.01

66. In the vector diagram shown, the baseline of the triangle that contains 10 represents the value of:

- E_c or E_L
- E_L or X_L
- Z or E
- E_R or R

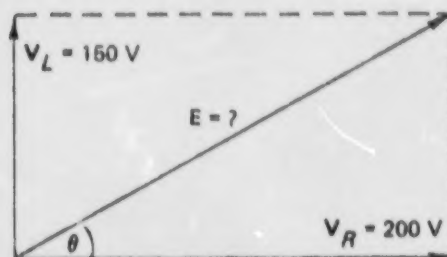
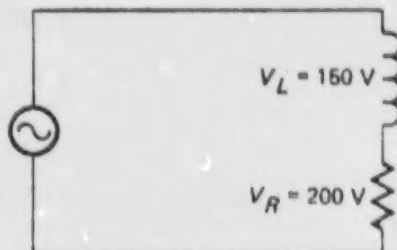


67. In the triangle referred to in Question 66, the vertical side that is equal in length to the side opposite it represents:
- E_L or X_L
 - E or Z
 - X_L or R
 - E_c or X_c

77.02.05.01 (Continued)

68. The resultant vector in the triangle referred to in Question 66 represents the value of:
- E or R
 - Z or R
 - X_L or X_C
 - E or Z
69. Solve for the applied voltage using the Pythagorean theorem;

- 350 V
- 250 V
- 50 V
- 100 V

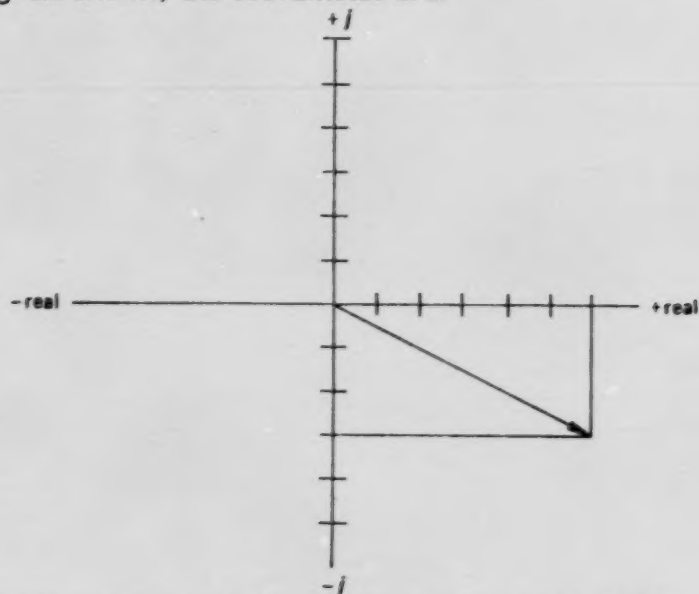


70. What is the PF of a circuit supplied by 600 VA and dissipating 300 W?
- 100%
 - 200%
 - 50%
 - 75%

77.02.05.02

71. In the vector diagram shown, the coordinates are:

- a. $6 - j3$
- b. $3 - j6$
- c. $6 + j3$
- d. $3 + j6$



72. The term $+j$ indicates counterclockwise rotation, whereas clockwise rotation is indicated by:

- a. -1
- b. $+j$
- c. $j + j$
- d. $-j$

73. To rotate a vector 180 degrees counterclockwise, the vector should be multiplied by the operator:

- a. j
- b. j^2
- c. j^3
- d. j^4

77.02.05.02 (Continued)

74. In mathematics, the standard symbol for the $\sqrt{-1}$ is:

- a. i
- b. j
- c. k
- d. l

75. Rectangular notation is another method of giving the two sides of a triangle. The reactive side of a triangle is represented by + or -:

- a. j
- b. l
- c. k
- d. π

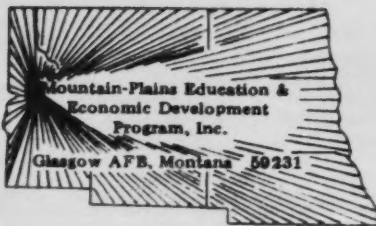
77.02.06.01

76. If the applied frequency is not changed but the inductance in a series RL circuit is increased, the current will:

- a. remain the same
- b. decrease
- c. increase
- d. equal $E_L/\cos$

77. If the frequency applied to a series RL circuit is increased, the circuit phase angle will:

- a. remain the same
- b. decrease
- c. increase
- d. equal $E/\cos$

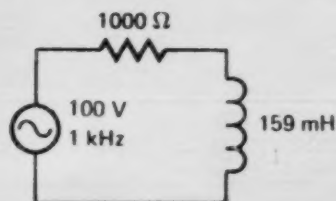
77.02.06.01 (Continued)

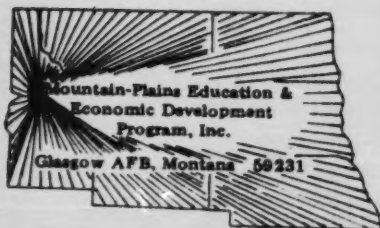
78. For a given applied frequency, if the inductance of a series RL circuit is increased, the circuit phase angle will:
- remain the same
 - decrease
 - increase
 - equal E/L
79. For a given applied frequency, if the inductance of a series RL circuit is decreased, the circuit current will:
- decrease
 - increase
 - remain the same
 - equal E/X_L
80. In an inductive circuit, if the frequency is decreased, the current will be:
- increased
 - decreased
 - unaffected
 - squared

77.02.06.02

81. In an RL circuit, the cutoff frequency is the point where the true power has decreased to half the maximum power and:
- $X_L = X_C$
 - $X_L = R$
 - $P_t = P_a$
 - $\cos = \tan$
82. In the series RL circuit below, if the frequency applied is the f_{co} of the circuit, what is the value of X_L ?

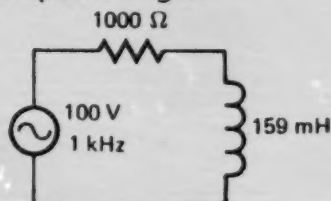
- 1 k Ω
- 100 Ω
- 159 Ω
- 2 k Ω



77.02.06.02 (Continued)

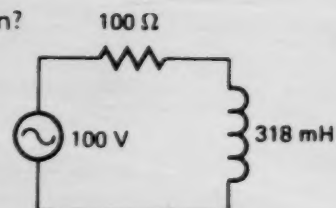
83. The effective resistance of any circuit is the combination of:
- DC resistance and the resistance caused by alternating current
 - DC resistance and the circuit reactances
 - all the voltage drops divided by circuit current
 - all the directly measurable resistances
84. In the series RL circuit shown, if the frequency applied is the f_{CO} of the circuit, what is the circuit phase angle?

- 45 degrees
- 120 degrees
- 70.7 degrees
- 90 degrees



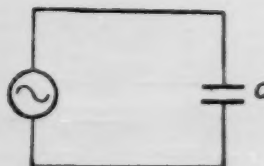
85. What is the cutoff frequency (f_{CO}) of the circuit shown?

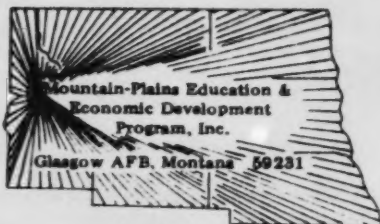
- 500 Hz
- 31.8 Hz
- 194 Hz
- 50 Hz

77.02.06.03

86. When a series RC circuit is used as a high-pass filter, the output is taken from across the:
- resistor
 - capacitor
 - resistor and capacitor
 - generator
87. In the illustration, the current:

- leads the voltage by 45 degrees
- lags the voltage by 45 degrees
- leads the voltage by 90 degrees
- lags the voltage by 90 degrees



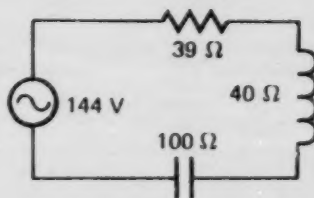
77.02.06.03 (Continued)

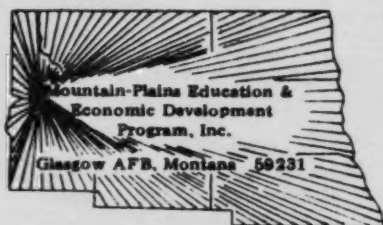
88. In a capacitive circuit, if the frequency is increased, the current will be:
- decreased
 - increased
 - unaffected
 - reduced slightly
89. If the applied frequency is unchanged but the value of capacitance increased in a series RC circuit, the current will:
- decrease
 - remain the same
 - increase
 - equal $E/\cos \Theta$
90. If the frequency applied to an RC circuit is decreased, the voltage drop across the capacitor will:
- remain the same
 - equal $E \times \cos \Theta$
 - increase
 - decrease

77.02.06.04

91. What is the impedance in the circuit below?

- $72 \Omega \angle -57^\circ$
- $72 \Omega \angle -33^\circ$
- $110 \Omega \angle -57^\circ$
- $110 \Omega \angle -33^\circ$

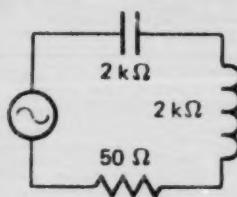


77.02.06.04 (Continued)

92. In a series RLC circuit, the current will be:
- greatest through R
 - equal in R, L, and C
 - greatest through L
 - greatest through C
93. The circuit Q may be maintained at a high level by keeping to a minimum the:
- reactance
 - resistance
 - capacitance
 - inductance
94. When a vector is multiplied by $+j$, the vector is rotated:
- counterclockwise 180 degrees
 - clockwise 90 degrees
 - clockwise 180 degrees
 - counterclockwise 90 degrees

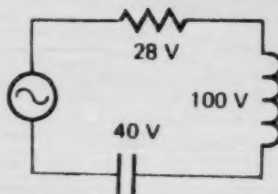
95. What is the Q of the circuit below?

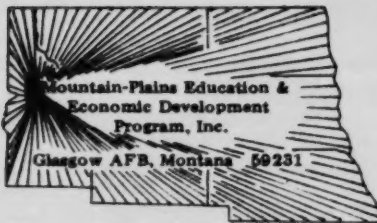
- 0.005
- 400
- 0.05
- 40

77.02.07.01

96. The total voltage in this circuit is:

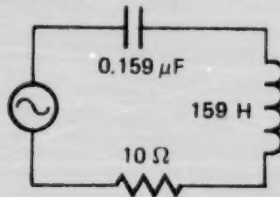
- 66 V $\angle 65^\circ$
- 31 V $\angle 65^\circ$
- 32 V $\angle 25^\circ$
- 66 V $\angle 25^\circ$



77.02.07.01 (Continued)

97. What is the resonant frequency in this circuit?

- a. 10 Hz
- b. 1 Hz
- c. 1000 Hz
- d. 100 Hz



98. If the frequency applied to a series RLC circuit is decreased to a frequency below resonance, the current will:

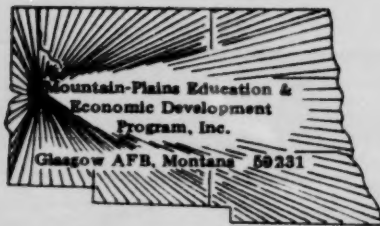
- a. increase
- b. decrease
- c. lag the voltage
- d. be unchanged

99. When the frequency of voltage applied to a coil decreases, the Q of the coil will:

- a. not change
- b. halve
- c. increase
- d. decrease

100. If a series RLC circuit is operating below resonance, the impedance will appear to be:

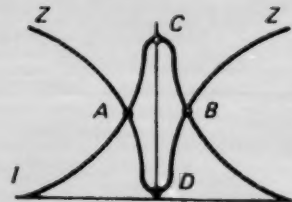
- a. decreased
- b. resistive
- c. capacitive
- d. inductive



77.02.07.02

101. What two points on the curves below, plotted on a logarithmic scale, indicate a resonant circuit?

- a. B and D
- b. A and B
- c. A and C
- d. C and D



102. When the frequency of voltage applied to a coil increases, the Q of the coil will:

- a. increase
- b. not change
- c. decrease
- d. double

103. What is the bandwidth of a series circuit if the resonant frequency is 50 Hz and the circuit Q is 50?

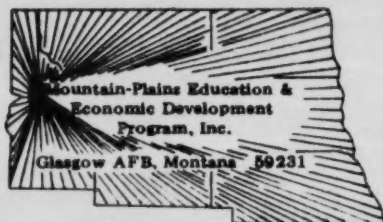
- a. 1 Hz
- b. 0.10 Hz
- c. 100 Hz
- d. 10 Hz

104. If the Q of the coil in a series resonant circuit is lowered, the bandwidth will:

- a. decrease
- b. not be affected
- c. increase
- d. equal R/X_L

105. In a series RLC circuit, the current will be:

- a. greatest through R
- b. equal in R, L, and C
- c. greatest through L
- d. greatest through C

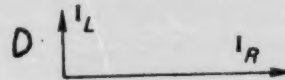
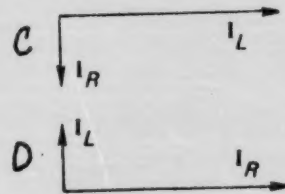
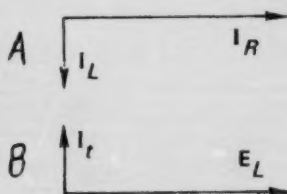
77.02.08.01

106. If the resistance is increased in an RL parallel circuit, the total current will be:

- a. unchanged
- b. reduced to zero
- c. increased
- d. decreased

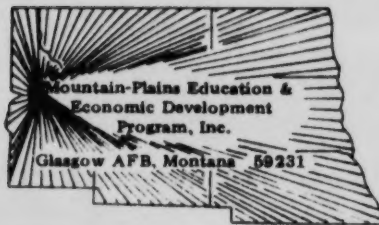
107. Which current vector diagram is correct for the circuit below?

- a. _____
- b. ☒ _____
- c. _____
- d. _____



108. What is the phase relationship between voltage and current in a parallel RL circuit?

- a. I_L leads E by 90 degrees
- b. I_R leads E by 90 degrees
- c. I_L lags E by 90 degrees
- d. I_R , I_L , and E are in phase

77.02.08.01 (Continued)

109. An equivalent impedance for a parallel RL circuit is valid only at a given operating frequency because the:

- a. true power of the circuit is inversely proportional to the frequency of the circuit
- b. reactive component varies with the frequency
- c. resistive voltage drop varies directly with the frequency
- d. applied voltage increases as the frequency is decreased

110. To determine the impedance of a parallel AC circuit,

- a. apply Ohm's law, assuming a voltage and total current
- b. add the resistance of the branches vectorially
- c. add the voltage of the branches vectorially
- d. add the current of the branches vectorially

77.02.08.02

111. Decreasing the frequency applied to a parallel RL circuit causes a decrease in:

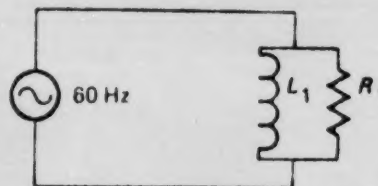
- a. I_L
- b. Z_T
- c. P_t
- d. I_R

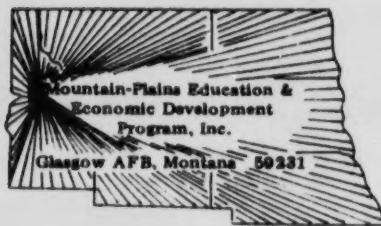
112. Decreasing the frequency applied to a parallel RL circuit causes an increase in:

- a. I_R
- b. Z_T
- c. P_t
- d. I_T

113. Increasing the frequency of applied voltage will cause the current through L_1 to:

- a. equal $E \times \cos \theta$
- b. increase
- c. remain the same
- d. decrease



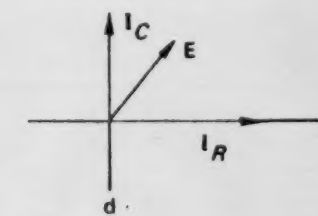
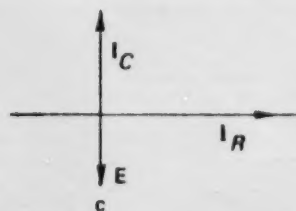
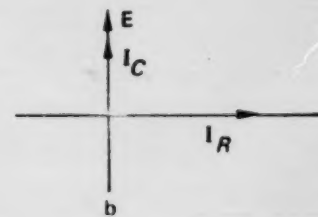
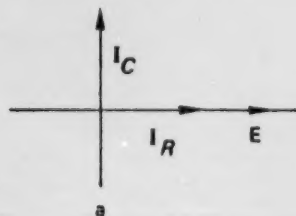
77.02.08.02 (Continued)

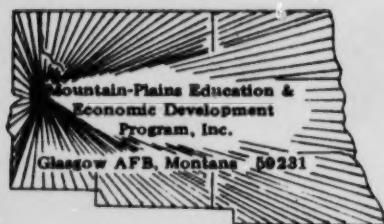
114. The addition of a resistor in series with the inductive branch in a parallel RL circuit will cause a decrease in the :
- power factor
 - phase angle
 - true power
 - resistive branch current
115. Increasing the frequency applied to a parallel RL circuit causes an increase in:
- I_L
 - phase angle
 - I_T
 - impedance

77.02.08.03

116. In a parallel RC circuit, the phase relationship of the branch currents and applied voltage is correctly represented by which vector diagram?

- _____
- _____
- _____
- _____

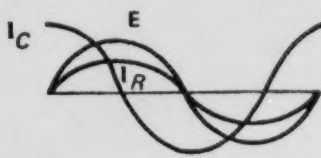




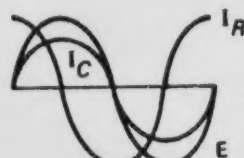
77.02.08.03 (Continued)

117. Which diagram illustrates the relationship between E , I_C , and I_R in a parallel RC circuit?

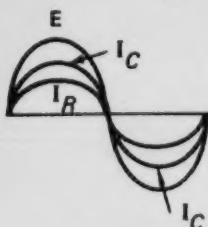
- a. _____
 b. _____
 c. _____
 d. _____



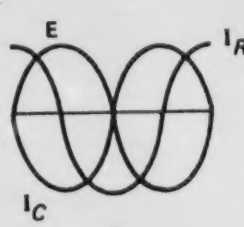
a



b



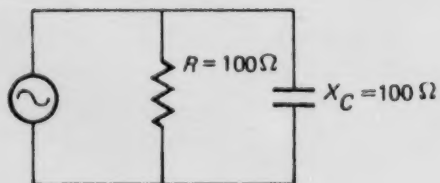
c



d

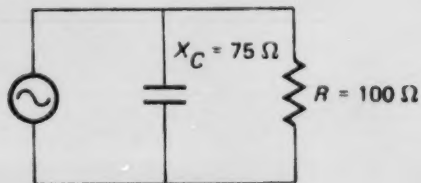
118. The total impedance of this circuit is:

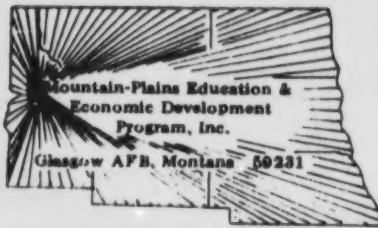
- a. 71 ohms
 b. 50 ohms
 c. 142 ohms
 d. 112 ohms



119. Determine total impedance of the circuit below:

- a. 125 ohms
 b. 175 ohms
 c. 100 ohms
 d. 60 ohms



77.02.08.03 (Continued)

120. Decreasing the frequency applied to the circuit below will cause a decrease in:

- a. total current
- b. impedance
- c. power factor
- d. capacitive reactance

77.02.08.04

121. If the frequency applied to a parallel LC circuit is increased from resonance, the current drawn from the source:

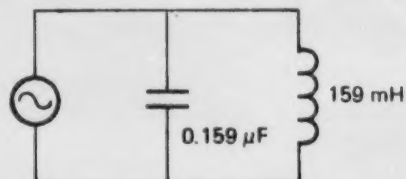
- a. increases
- b. appears inductive
- c. decreases
- d. lags the voltage

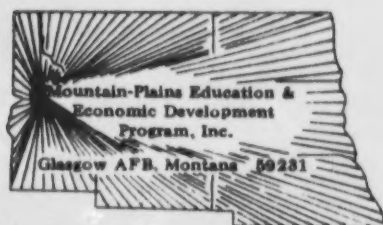
122. If a parallel LC circuit is at resonance and X_L is 2000 ohms, what is the value of X_C ?

- a. 4000 ohms
- b. 1000 ohms
- c. 2000 ohms
- d. 20 K ohms

123. Determine the resonant frequency of the circuit below:

- a. 10 KHz
- b. 1 KHz
- c. 100 KHz
- d. 1000 KHz



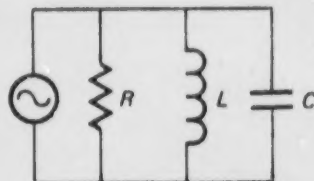
77.02.08.04 (Continued)

124. Decreasing the frequency applied to a parallel LC circuit from resonance cause current drawn from the source to:

- a. increase
- b. decrease
- c. lead the voltage
- d. appear capacitive

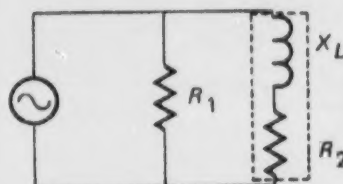
125. To determine the resonant frequency of the circuit below, what values must be known?

- a. L and C
- b. R and L
- c. C and R
- d. applied frequency and Z

77.02.08.05

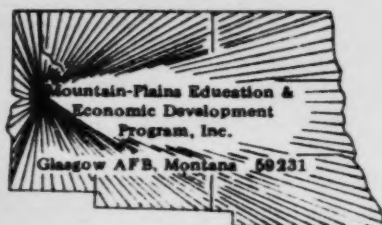
126. If the Q of the coil is greater than 10, the effect of R_2 on the impedance of the circuit is:

- a. to double impedance
- b. to increase impedance
- c. to decrease impedance
- d. negligible



127. Replacing a high-Q coil with a low-Q coil in a parallel RL circuit will cause:

- a. a decrease in phase angle
- b. an increase in phase angle
- c. no change in circuit current
- d. an increase in the voltage drop across the coil

77.02.08.05 (Continued)

128. A decrease in effective resistance in a parallel RL circuit will have what effect on the voltage drop across the inductor?
- a. first an increase, then a decrease in V_L
 - b. a decrease in V_L
 - c. an increase in V_L
 - d. no change in V_L
129. Increasing R_{eff} of the coil in a parallel RL circuit will have what effect on true power?
- a. an increase in resistance
 - b. no effect
 - c. a decrease in P_t
 - d. an increase in P_t
130. If the R_{eff} of the coil in a parallel RL circuit is increased, the power factor of the circuit will:
- a. decrease
 - b. remain the same
 - c. increase
 - d. go to zero



Learning Experience Guide

UNIT: INTRODUCTION TO A.C.

RATIONALE:

Understanding what AC voltage is and how it is generated is basic knowledge for a serviceman.

PREREQUISITES:

Course: D.C. Circuits

OBJECTIVES:

Identify an electrical generator, its parts, its function and explain its operational characteristics.

RESOURCES:

Printed Materials

AC Circuits, An Individualized Approach to Electronics (booklet--Unit 1: Introduction To AC--, progress tests). Paul E. Trejo, Westinghouse Learning Corporation, New York, New York, 1972.

GENERAL INSTRUCTIONS:

You have been prescribed into the first unit of this course. The activities that you perform will be assigned one at a time. A LAP will give you directions for each activity. Read the LAP and follow the procedure and directions given.

When you finish the performance activities for the unit, you will be given a unit test as stated in the "Evaluation Procedures" for post testing. After successful completion of the unit test, the next assigned unit for the course is begun.

PERFORMANCE ACTIVITIES:

- .01 Generating AC Voltage
- .02 AC and DC Generators

EVALUATION PROCEDURE:

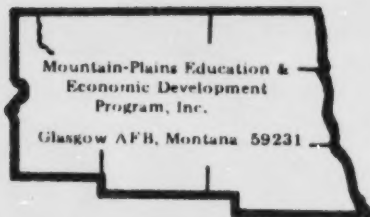
The student takes a progress test about the major concepts and procedures presented in the unit activities.

Successful completion is correctly answering at least 80% of the test items.

FOLLOW-THROUGH:

12

After reading this guide, go to the first assigned LAP. If you have any questions.



Learning Activity Package

Student: _____

Date: _____

PERFORMANCE ACTIVITY: Generating AC Voltage

OBJECTIVES:

Identify the symbol for alternating current.

Identify factors that determine frequency of a generating system.

Determine the time required for one cycle, given the generator conditions.

Identify the peak to peak, effective and average voltages, and frequency of a given sine wave.

Given several illustrations of flux lines in AC generators, identify which would produce maximum peak to peak voltage.

EVALUATION PROCEDURE:

Student is to score at least 80% on the unit test for questions pertaining to this performance activity.

RESOURCES:

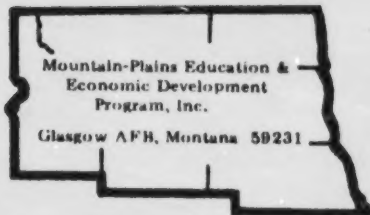
AC Circuits, An Individualized Approach to Electronics (booklet--Unit 1: Introduction to AC--), Trejo.

PROCEDURE:

1. Read pages 3-28 in Unit 1, AC Circuits.
2. Answer questions within the chapter.
3. Proceed to next LAP.

Principal Author(s):

P. Schuster, B. Vetter



File Code: 77.02.01.02.A2-0

Date Published: 9/11/75

Learning Activity Package

Student: _____

Date: _____

PERFORMANCE ACTIVITY: AC and DC Generators

OBJECTIVES:

Name and state the function for each part of a typical alternating current generator.

Recognize differences between alternating and direct current generators.

EVALUATION PROCEDURE:

Student is to score at least 80% on the unit test for questions pertaining to this performance activity.

RESOURCES:

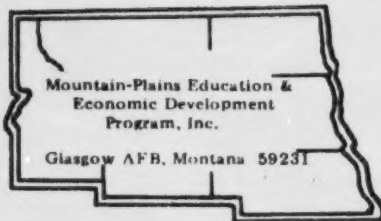
AC Circuits, An Individualized Approach to Electronics (booklet--Unit 1: Introduction to AC--, progress test), Trejo.

PROCEDURE:

1. Read pages 29-38 in Unit 1, AC Circuits.
2. Answer questions within the chapter.
3. Take the unit progress test.

Principal Author(s):

P. Schuster, B. Vetter



Learning Experience Guide

UNIT: A.C. RELATIONSHIPS

RATIONALE:

Electrical properties are interrelated. Understanding these relationships in AC circuits provides a logic for diagnosis of circuits in electrical/electronic devices.

PREREQUISITES:

Unit: Introduction to A.C.

OBJECTIVES:

Explain relationships between current and electromotive force in inductive and capacitive AC circuits.

Define and calculate impedance, reactance and power for AC circuits.

RESOURCES:

Printed Materials

AC Circuits, An Individualized Approach to Electronics (booklet--Unit 2: AC Relationships--, progress tests). Paul E. Trejo, Westinghouse Corporation, New York, New York, 1972.

GENERAL INSTRUCTIONS:

You have been prescribed into the second unit of this course. The activities that you perform will be assigned one at a time. A LAP will give you directions for each activity. Read the LAP and follow the procedure and directions given.

When you finish the performance activities for the unit, you will be given a unit test as stated in the "Evaluation Procedures" for post testing. After successful completion of the unit test, the next assigned unit for the course is begun.

PERFORMANCE ACTIVITIES:

- .01 Inductive Reactance
- .02 Inductive Phase Relationships
- .03 Capacitive Reactance
- .04 Voltage and Impedance
- .05 Power in AC Circuits

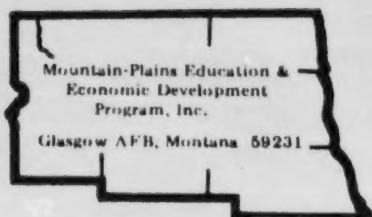
EVALUATION PROCEDURE:

The student takes a progress test about the major concepts and procedures presented in the unit activities.

Successful completion is correctly answering at least 80% of the test items.

FOLLOW-THROUGH:

You are now ready to begin the first assigned LAP. If you have questions, consult your instructor.



File Code: 77.02.02.01.A2-0

Date Published: 9/11/75

Learning Activity Package

Student: _____

Date: _____

PERFORMANCE ACTIVITY: Inductive Reactance

OBJECTIVES:

Define inductive reactance.

Identify factors that affect inductive reactance.

Compute inductive reactance values for given circuits.

EVALUATION PROCEDURE:

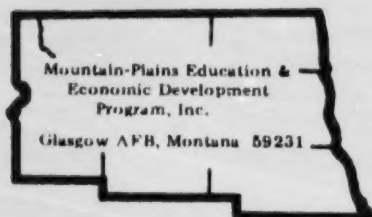
AC Circuits, An Individualized Approach to Electronics (booklet--Unit 2:
AC Relationships--), Trejo.

PROCEDURE:

1. Read pages 3-10 in Unit 2, AC Circuits.
2. Answer questions within the chapter.
3. Proceed to next LAP.

Principal Author(s):

P. Schuster, B. Vetter



File Code: 77.02.02.02.A2-0

Date Published: 9/11/75

Learning Activity Package

Student: _____

Date: _____

PERFORMANCE ACTIVITY: Inductive Phase Relationships

OBJECTIVES:

Describe and illustrate relationships of voltage and current in AC inductive circuits.

EVALUATION PROCEDURE:

Student is to score at least 80% on the unit test for questions pertaining to this performance activity.

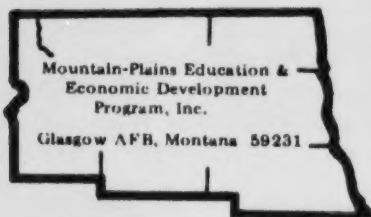
RESOURCES:

AC Circuits, An Individualized Approach to Electronics (booklet--Unit 2: AC Relationships--), Trejo.

PROCEDURE:

1. Read pages 11-25 in Unit 2, AC Circuits.
2. Answer questions within the chapter.
3. Proceed to next LAP.

Principal Author(s): P. Schuster, B. Vetter



File Code: 77.02.02.03.A2-0

Date Published: 9/11/75

Learning Activity Package

Student: _____

Date: _____

PERFORMANCE ACTIVITY: Capacitive Reactance

OBJECTIVES:

Define capacitive reactance.

Identify factors that affect capacitive reactance.

Compute capacitive reactance values for given circuits.

EVALUATION PROCEDURE:

Student is to score at least 80% on the unit test for questions pertaining to this performance activity.

RESOURCES:

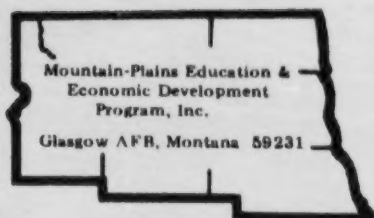
AC Circuits, An Individualized Approach to Electronics (booklet--Unit 2: AC Relationships--), Trejo.

PROCEDURE:

1. Read pages 26-39 in Unit 2, AC Circuits.
2. Answer questions within the chapter.
3. Proceed to next LAP.

Principal Author(s):

P. Schuster, B. Vetter



File Code: 77.02.02.04.A2-0

Date Published: 9/11/75

Learning Activity Package

Student: _____

Date: _____

PERFORMANCE ACTIVITY: Voltage and Impedance

OBJECTIVE:

Define impedance.

Explain relationship between AC voltage and impedance.

EVALUATION PROCEDURE:

Student is to score at least 80% on the unit test for questions pertaining to this performance activity.

RESOURCES:

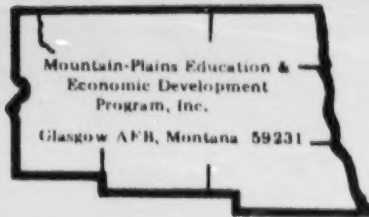
AC Circuits, An Individualized Approach to Electronics (booklet--Unit 2: AC Relationships--), Trejo.

PROCEDURE:

1. Read pages 40-53 in Unit 2, AC Circuits.
2. Answer questions within the chapter.
3. Proceed to next LAP.

Principal Author(s):

P. Schuster, B. Vetter



Learning Activity Package

Student: _____

Date: _____

PERFORMANCE ACTIVITY: Power in AC Circuits

OBJECTIVE:

Define apparent and true power and explain their relationship.

EVALUATION PROCEDURE:

Student is to score at least 80% on the unit test for questions pertaining to this performance activity.

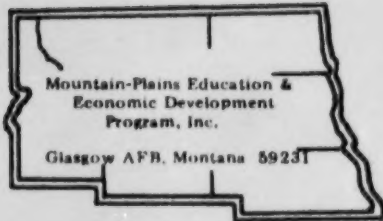
RESOURCES:

AC Circuits, An Individualized Approach to Electronics (booklet--Unit 2: AC Relationships--, progress test), Trejo.

PROCEDURE:

1. Read pages 54-64 in Unit 2, AC Circuits.
2. Answer questions within the chapter.
3. Take the unit progress test.

Principal Author(s): P. Schuster, B. Vetter



Learning Experience Guide

UNIT: THE TRANSFORMER

RATIONALE:

The transformer is a very commonly used electrical/electronic component used to transfer electrical energy from one circuit to another. A service person will have to diagnose and repair circuits using transformers.

PREREQUISITES:

Unit: A.C. Relationships

OBJECTIVE:

Identify a transformer, its application and explain its characteristics of operation.

RESOURCES:

Printed Materials

AC Circuits, An Individualized Approach to Electronics (booklet--Unit 3: The Transformer--, progress tests). Paul E. Trejo, Westinghouse Learning Corporation, New York, New York, 1972.

GENERAL INSTRUCTIONS:

You have been prescribed into the third unit of this course. The activities that you perform will be assigned one at a time. A LAP will give you directions for each activity. Read the LAP and follow the procedure and directions given.

When you finish the performance activities for the unit, you will be given a unit test as stated in the "Evaluation Procedures" for post testing. After successful completion of the unit test, the next assigned unit for the course is begun.

PERFORMANCE ACTIVITIES:

- .01 Transformer Operation and Construction
- .02 Transformer Theory
- .03 Turns Ratio and Power
- .04 Practical Transformers

Principal Author(s): P. Hoggatt

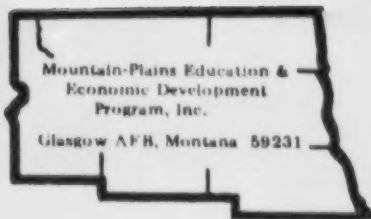
EVALUATION PROCEDURE:

The student takes a progress test about the major concepts and procedures presented in the unit activities.

Successful completion is correctly answering at least 80% of the test items.

FOLLOW-THROUGH:

After completing this guide, begin with the first assigned LAP.



File Code: 77.02.03.01.A2-0

Date Published: 9/11/75

Learning Activity Package

Student: _____

Date: _____

PERFORMANCE ACTIVITY: Transformer Operation and Construction

OBJECTIVES:

Identify a transformer and explain its function.

Identify transformer parts.

EVALUATION PROCEDURE:

Student is to score at least 80% on the unit test for questions pertaining to this performance activity.

RESOURCES:

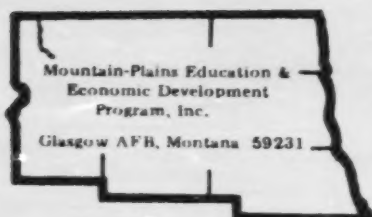
AC Circuits, An Individualized Approach to Electronics (booklet--Unit 3: The Transformer--), Trejo.

PROCEDURE:

1. Read pages 3-17 in Unit 3, AC Circuits.
2. Answer questions within the chapter.
3. Proceed to next LAP.

Principal Author(s):

P. Schuster, B. Vetter



Learning Activity Package

Student: _____

Date: _____

PERFORMANCE ACTIVITY: Transformer Theory

OBJECTIVE:

Explain the operational theory of a transformer.

EVALUATION PROCEDURE:

Student is to score at least 80% on the unit test for questions pertaining to this performance activity.

RESOURCES:

AC Circuits, An Individualized Approach to Electronics (booklet--Unit 3: The Transformer--), Trejo.

PROCEDURE:

1. Read pages 18-28 in Unit 3, AC Circuits.
2. Answer questions within the chapter.
3. Proceed to next LAP.

Principal Author(s):

P. Schuster, B. Vetter



File Code: 77.02.03.03.A2-0

Date Published: 9/11/75

Learning Activity Package

Student: _____

Date: _____

PERFORMANCE ACTIVITY: Turns Ratio and Power

OBJECTIVE:

Determine current ratios, voltage ratios and power for given transformers.

EVALUATION PROCEDURE:

Student is to score at least 80% on the unit test for questions pertaining to this performance activity.

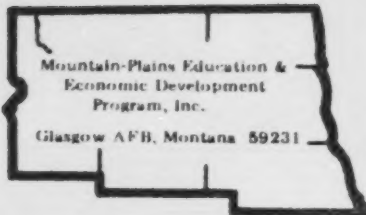
RESOURCES:

AC Circuits, An Individualized Approach to Electronics (booklet--Unit 3: The Transformer--), Trejo.

PROCEDURE:

1. Read pages 29-45 in Unit 3, AC Circuits.
2. Answer questions within the chapter.
3. Proceed to next LAP.

Principal Author(s): P. Schuster, B. Vetter



Learning Activity Package

Student: _____

Date: _____

PERFORMANCE ACTIVITY: Practical Transformers

OBJECTIVES:

Identify transformer power losses.

Compute transformer efficiency.

EVALUATION PROCEDURE:

Student is to score at least 80% on the unit test for questions pertaining to this performance activity.

RESOURCES:

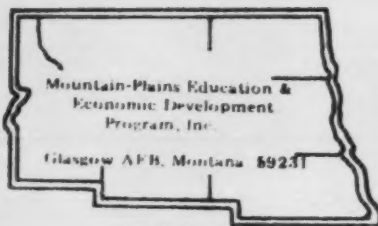
AC Circuits, An Individualized Approach to Electronics (booklet--Unit 3: The Transformer--, progress tests), Trejo.

PROCEDURE:

1. Read pages 46-63 in Unit 3, AC Circuits.
2. Answer questions within the chapter.
3. Take the unit progress test.

Principal Author(s):

P. Schuster, B. Vetter



Learning Experience Guide

UNIT: POWER SUPPLIES

RATIONALE:

Power supplies furnish the voltages needed to operate electronic equipment. A serviceman must understand the functions of power supplies to be effective in operating and repairing them.

PREREQUISITES:

Unit: The Transformer

OBJECTIVES:

Identify electronic power supplies, identify its function and explain its operational characteristics.

RESOURCES:

AC Circuits, An Individualized Approach to Electronics (booklet--Unit 4: Power Supplies-- progress tests). Paul E. Trejo, Westinghouse Learning Corporation, New York, New York, 1972.

GENERAL INSTRUCTIONS:

You have been prescribed into the fourth unit of this course. The activities that you perform will be assigned one at a time. A LAP will give directions for each activity. Read the LAP and follow the procedure and directions given.

When you finish the performance activities for the unit, you will be given a unit test as stated in the "Evaluation Procedures" for post testing. After successful completion of the unit test, the next assigned unit for the course is begun.

PERFORMANCE ACTIVITIES:

- .01 Semiconductor Rectifiers
- .02 Power Supply Filters

Principal Author(s):

P. Hoggatt

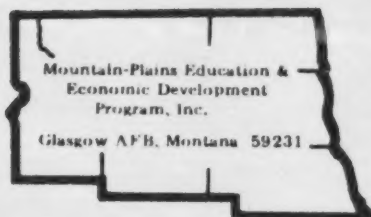
EVALUATION PROCEDURE:

The student takes a progress test about the major concepts and procedures presented in the unit activities.

Successful completion is correctly answering at least 80% of the test items.

FOLLOW-THROUGH:

You may begin with LAP .01 after completing this guide.



File Code: 77.02.04.01.A2-0

Date Published: 11/11/75

Learning Activity Package

Student: _____

Date: _____

PERFORMANCE ACTIVITY: Semiconductor Rectifiers

OBJECTIVES:

Identify the functions of rectifiers and a power supply.

Diagram and explain half-wave and full-wave rectification.

Explain ripple frequency.

EVALUATION PROCEDURE:

Student is to score at least 80% on the unit test for questions pertaining to this performance activity.

RESOURCES:

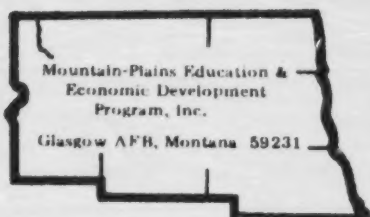
AC Circuits, An Individualized Approach to Electronics (booklet - Unit 4: Power Supplies--), Trejo.

PROCEDURE:

1. Read pages 3-16 in Unit 4, AC Circuits.
2. Answer questions within the Chapter.
3. Go to the next LAP.

Principal Author(s):

P. Schuster, B. Vetter



File Code: 77.02.04.02.A2-0

Date Published: 11/11/75

Learning Activity Package

Student: _____

Date: _____

PERFORMANCE ACTIVITY: Power Supply Filters

OBJECTIVES:

Diagram a choke-input, capacitor-input and pi-section filters.

Explain the function of a power supply filter.

EVALUATION PROCEDURE:

Student is to score at least 80% on the unit test for questions pertaining to this performance activity.

RESOURCES:

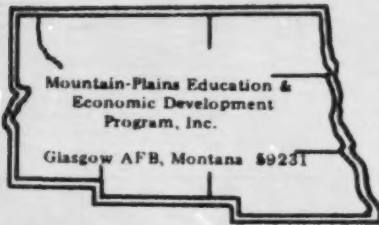
AC Circuits, An Individualized Approach to Electronics (booklet - Unit 4: Power Supplies--, progress test), Trejo.

PROCEDURE:

1. Read pages 17-30 in Unit 4, AC Circuits.
2. Answer questions within the Chapter.
3. Take the Unit Progress Test.

Principal Author(s):

P. Schuster, B. Vetter



Learning Experience Guide

UNIT: A.C. COMPUTATIONS

RATIONALE:

The ability to compute circuit values is necessary for a more complete understanding of the circuit characteristics. The more known about circuits the easier troubleshooting techniques are developed.

PREREQUISITES:

Unit: Power Supplies

OBJECTIVE:

Use mathematics to describe the electronic properties of alternating current series circuitry.

RESOURCES:

AC Circuits, An Individualized Approach to Electronics (booklet - Unit 5: A.C. Computations-- , student handbook, progress tests). Paul E. Trejo, Westinghouse Learning Corporation, New York, New York, 1972.

GENERAL INSTRUCTIONS:

You have been prescribed into the fifth unit of this course. The activities that you perform will be assigned one at a time. A LAP will give you directions for each activity. Read the LAP and follow the procedure and directions given.

When you finish the performance activities for the unit, you will be given a unit test as stated in the "Evaluation Procedures" for post testing. After successful completion of the unit test, the next assigned unit for the course is begun.

PERFORMANCE ACTIVITIES:

- .01 Vectors
- .02 Rectangular and Polar Notation

Principal Author(s):

P. Hoggatt

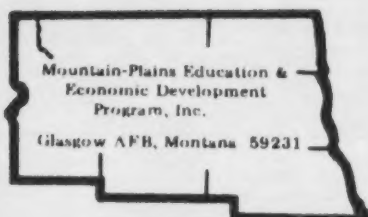
EVALUATION PROCEDURE:

The student takes a progress test about the major concepts and procedures presented in the unit activities.

Successful completion is correctly answering at least 80% of the test items.

FOLLOW-THROUGH:

Go to the first assigned Learning Activity Package (LAP) for this Unit.
If you have questions, consult with your instructor.



Learning Activity Package

Student: _____

Date: _____

PERFORMANCE ACTIVITY: Vectors

OBJECTIVE:

Calculate voltage and current phase relationships in alternating current series circuits using vector analysis.

EVALUATION PROCEDURE:

Student is to score at least 80% on the unit test for questions pertaining to this performance activity.

RESOURCES:

AC Circuits, An Individualized Approach to Electronics (booklet - Unit 5: A.C. Computations-- , student handbook), Trejo.

PROCEDURE:

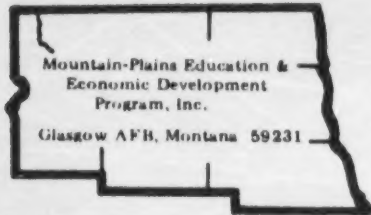
1. Read pages 3-18 in Unit 5, AC Circuits.
2. Answer questions within the Chapter.
3. Proceed to the next LAP.

Principal Author(s):

P. Schuster, B. Vetter

File Code: 77.02.05.02.A2-0

Date Published: 11/11/75



Learning Activity Package

Student: _____

Date: _____

PERFORMANCE ACTIVITY: Rectangular and Polar Notation

OBJECTIVE:

Calculate the impedance of alternating current series circuits using polar and rectangular notations.

EVALUATION PROCEDURE:

Student is to score at least 80% on the unit test for questions pertaining to this performance activity.

RESOURCES:

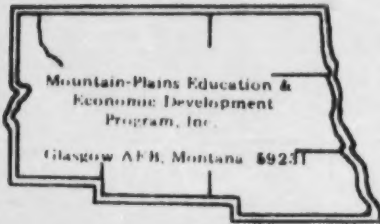
AC Circuits, An Individualized Approach to Electronics (booklet - Unit 5: A.C. Computations--, progress--, student handbook, progress test), Trejo.

PROCEDURE:

1. Read pages 19-40 in Unit 5, AC Circuits.
2. Answer questions within the Chapter.
3. Take the Unit Progress Test.

Principal Author(s):

P. Schuster, B. Vetter



Learning Experience Guide

UNIT: SERIES RESISTIVE-REACTIVE CIRCUITS

RATIONALE:

An understanding of relationships between resistance, inductance, frequency, current and power is essential in order to explain characteristics of series resistive-reactive circuits.

PREREQUISITES:

Unit: AC Computations

OBJECTIVE:

Identify electronic properties and explain their relationships for resistive-inductive and resistive-capacitive alternating current series circuits.

RESOURCES:

AC Circuits, An Individualized Approach to Electronics (booklet- Unit 6: Series Resistive-Reactive Circuits--, student handbook, progress test). Paul E. Trejo, Westinghouse Learning Corporation, New York, New York, 1972.

GENERAL INSTRUCTIONS:

You have been prescribed into the sixth unit of this Course. The activities that you perform will be assigned one at a time. A LAP will give you directions for each activity. Read the LAP and follow the procedure and directions given.

When you have finished the performance activities for the unit, you will be given a unit test as stated in the "Evaluation Procedures" for post testing. After successful completion of the unit test, the next assigned unit for the course is begun.

PERFORMANCE ACTIVITIES:

- .01 Variational Analysis of Series RL Circuits
- .02 RL Filter Circuits
- .03 Series RC Circuits
- .04 Series RLC Circuits

Principal Author(s):

P. Hoggatt

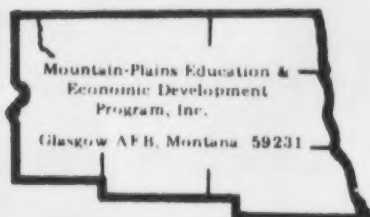
EVALUATION PROCEDURE:

The student takes a progress test about the major concepts and procedures presented in the unit activities.

Successful completion is correctly answering at least 80% of the test items.

FOLLOW-THROUGH:

If you have questions, consult with your instructor. Please begin the first assigned LAP.



File Code: 77.02.06.01.A2-0

Date Published: 11/14/75

Learning Activity Package

Student: _____

Date: _____

PERFORMANCE ACTIVITY: Variational Analysis of Series RL Circuits

OBJECTIVE:

Determine the effect that varying the frequency, resistance, applies voltage or inductance has on the impedance of a series RL circuit.

EVALUATION PROCEDURE:

Student is to score at least 80% on the unit test for questions pertaining to this performance activity.

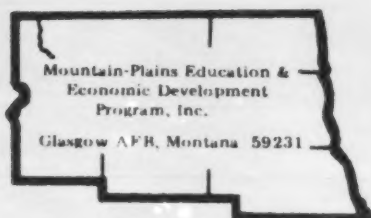
RESOURCES:

AC Circuits, An Individualized Approach to Electronics (booklet- Unit 6: Series Resistive-Reactive Circuits--, student handbook), Trejo.

PROCEDURE:

1. Read pages 3-10, Unit 6 in AC Circuits.
2. Answer questions within the Chapter.
3. Proceed to next LAP.

Principal Author(s): P. Schuster, B. Vetter



File Code: 77.02.06.02 A2-0

Date Published: 11/14/75

Learning Activity Package

Student: _____

Date: _____

PERFORMANCE ACTIVITY: RL Filter Circuits

OBJECTIVE:

Determine the effects of frequency on series RL circuits.

Determine the cut-off frequency of a series RL circuit.

Explain cut-off and half-power point for a series RL circuit.

Identify RL low-pass and high-pass filters.

EVALUATION PROCEDURE:

Student is to score at least 80% on the unit test for questions pertaining to this performance activity.

RESOURCES:

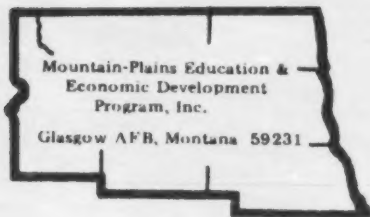
AC Circuits, An Individualized Approach to Electronics (booklet - Unit 6: Series Resistive-Reactive Circuits--, student handbook), Trejo.

PROCEDURE:

1. Read pages 11-22, Unit 6 in AC Circuits.
2. Answer questions within the chapter.
3. Proceed to the next LAP.

Principal Author(s):

P. Schuster, B. Vetter



File Code: 77.02.06.03.A2-0

Date Published: 11/14/75

Learning Activity Package

Student: _____

Date: _____

PERFORMANCE ACTIVITY: Series RC Circuits

OBJECTIVES:

Determine the effects of frequency on series RC circuits.

Explain RC low-pass and high-pass filters.

Calculate the impedance of a series RC circuit using vector diagrams.

Determine the effect that varying the frequency, resistance, applied voltage or inductance has on the impedance of a series RC circuit.

EVALUATION PROCEDURE:

Student is to score at least 80% on the unit test for questions pertaining to this performance activity.

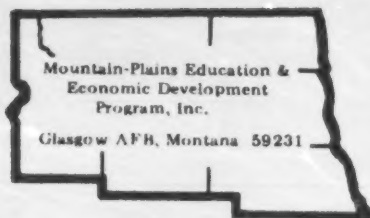
RESOURCES:

AC Circuits, An Individualized Approach to Electronics (booklet - Unit 6: Series Resistive-Reactive Circuits--, student handbook), Trejo.

PROCEDURE:

1. Read pages 23-35, Unit 6 in AC Circuits.
2. Answer questions within the chapter.
3. Proceed to the next LAP.

Principal Author(s): P. Schuster, B. Vetter



File Code: 77.02.06.04.A2-0

Date Published: 11/14/75

Learning Activity Package

Student: _____

Date: _____

PERFORMANCE ACTIVITY: Series RLC Circuits

OBJECTIVES:

Explain the figure of merit (Q) of a coil, skin effect and proximity effect.

Calculate impedance in a series RLC circuit.

EVALUATION PROCEDURE:

Student is to score at least 80% on the unit test for questions pertaining to this performance activity.

RESOURCES:

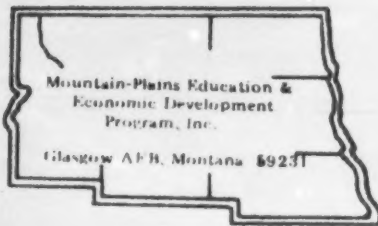
AC Circuits, An Individualized Approach to Electronics (booklet - Unit 6: Series Resistive-Reactive Circuits--, student handbook, progress tests), Trejo.

PROCEDURE:

1. Read pages 36-47, Unit 6, AC Circuits.
2. Answer questions within the chapter.
3. Take the Unit Progress Test.

Principal Author(s):

P. Schuster, B. Vetter



Learning Experience Guide

UNIT: SERIES RESONANCE

RATIONALE:

An understanding of series resonance is the basis for explaining tuning and alignment.

PREREQUISITES:

Unit: Series Resistive-Reactive Circuits

OBJECTIVE:

Identify and calculate series circuit characteristics at, above and below resonant frequency.

RESOURCES:

AC Circuits, An Individualized Approach to Electronics (booklet - Unit 7: Series Resonance--, student handbook, progress tests). Paul E. Trejo, Westinghouse Learning Corporation, New York, New York, 1972.

GENERAL INSTRUCTIONS:

You have been prescribed into the seventh unit of this Course. The activities that you perform will be assigned one at a time. A LAP will give you directions for each activity. Read the LAP and follow the procedure and directions given.

When you finish the performance activities for the unit, you will be given a unit test as stated in the "Evaluation Procedure" for post testing. After successful completion of the unit test, the next assigned unit for the Course is begun.

PERFORMANCE ACTIVITIES:

- .01 Series Resonance
- .02 Current Behavior and Resonance

Principal Author(s):

P. Hoggatt

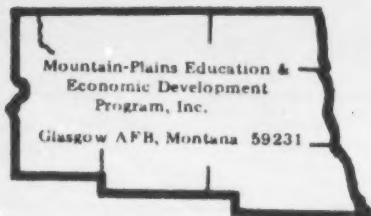
EVALUATION PROCEDURE:

The student takes a progress test about the major concepts and procedures presented in the unit activities.

Successful completion is correctly answering at least 80% of the test items.

FOLLOW-THROUGH:

At this time, you may begin with the first assigned LAP.



File Code: 77 02 07 01 A2-0

Date Published: 11/14/75

Learning Activity Package

Student: _____

Date: _____

PERFORMANCE ACTIVITY: Series Resonance

OBJECTIVES:

Calculate voltage drop across reactive elements in a series circuit using formulas.

Explain conditions for series resonance.

EVALUATION PROCEDURE:

Student is to score at least 80% on the unit test for questions pertaining to this performance activity.

RESOURCES:

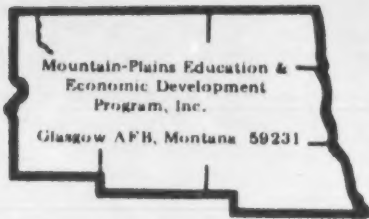
AC Circuits, An Individualized Approach to Electronics (booklet - Unit 7: Series Resonance--, student handbook), Trejo.

PROCEDURE:

1. Read pages 3-11, Unit 7 in AC Circuits.
2. Answer questions within the chapter.
3. Proceed to the next LAP.

Principal Author(s):

P. Schuster, B. Vetter



File Code: 77.02.07.02.A2-0

Date Published: 1/14/75

Learning Activity Package

Student: _____

Date: _____

PERFORMANCE ACTIVITY: Current Behavior and Resonance

OBJECTIVES:

Diagram current and impedance curves for series circuits at resonant frequency.

Identify series circuit resonant behavior above and below the resonant frequency.

Explain how series resonant circuits are used as filters.

EVALUATION PROCEDURE:

Student is to score at least 80% on the unit test for questions pertaining to this performance activity.

RESOURCES:

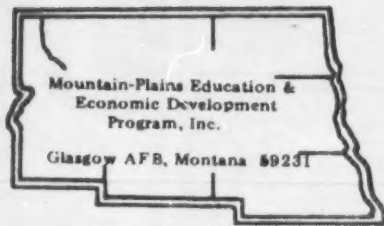
AC Circuits, An Individualized Approach to Electronics (booklet - Unit 7: Series Resonance-- , student handbook, progress test), Trejo.

PROCEDURE:

1. Read pages 12-24, Unit 7 in AC Circuits.
2. Answer questions within the chapter.
3. Take the Unit Progress Test.

Principal Author(s):

P. Schuster, B. Vetter



Learning Experience Guide

UNIT: PARALLEL RESISTIVE-REACTIVE CIRCUITS

RATIONALE:

An understanding of parallel resonance is basic to explaining circuit filtering of frequencies.

PREREQUISITES:

Unit: Series Resonance

OBJECTIVE:

Identify and calculate parallel circuit characteristics at, above and below resonant frequency.

RESOURCES:

AC Circuits, An Individualized Approach to Electronics (booklet - Unit 8: Parallel Resistive-Reactive Circuits--, student handbook, progress tests). Paul E. Trejo, Westinghouse Learning Corporation, New York, New York, 1972.

GENERAL INSTRUCTIONS:

You have been prescribed into the eighth unit of this course. The activities that you perform will be assigned one at a time. A LAP will give you directions for each activity. Read the LAP and follow the procedure and directions given.

When you finish the performance activities for the unit, you will be given a unit test as stated in the "Evaluation Procedure" for post testing. After successful completion of the unit test, proceed to the next assigned course.

PERFORMANCE ACTIVITIES:

- .01 Parallel RL Circuits
- .02 Variational Analysis of Parallel RL Circuits
- .03 Parallel RC and RLC Circuits
- .04 Parallel Resonance
- .05 Practical RL Circuits

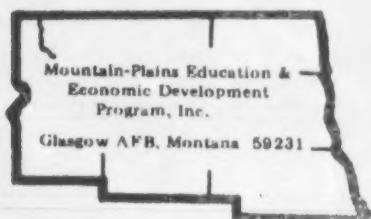
EVALUATION PROCEDURE:

The student takes a progress test about the major concepts and procedures presented in the unit activities.

Successful completion is correctly answering at least 80% of the test items.

FOLLOW-THROUGH:

Proceed to the first assigned Learning Activity Package (LAP) listed on your Student Progress Record (SPR).



File Code: 77.02.08.01.A2-0

Date Published: 11/14/75

Learning Activity Package

Student: _____

Date: _____

PERFORMANCE ACTIVITY: Parallel RL Circuits

OBJECTIVES:

Determine the effect that varying the frequency, resistance, applied voltage or inductance has on impedance of a parallel RL circuit.

Calculate the current, impedance, power and power factor for parallel RL circuits using formulas.

EVALUATION PROCEDURE:

Student is to score at least 80% on the unit test for questions pertaining to this performance activity.

RESOURCES:

AC Circuits, An Individualized Approach to Electronics (booklet - Unit 8: Parallel Resistive-Reactive Circuits--, student handbook), Trejo.

PROCEDURE:

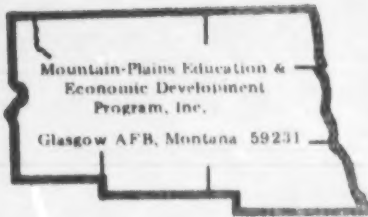
1. Read pages 3-18, Unit 8 in AC Circuits.
2. Answer questions within the chapter.
3. Proceed to the next IAP.

Principal Author(s):

P. Schuster, B. Vetter

File Code: 77.02.08.02.A2-0

Date Published: 11/14/75



Learning Activity Package

Participant: _____

Date: _____

PERFORMANCE ACTIVITY: Variational Analysis of Parallel RL Circuits

OBJECTIVE:

Use variational analysis to calculate the current, impedance, power and power factor for parallel RC circuits.

EVALUATION PROCEDURE:

Student is to score at least 80% on the unit test for questions pertaining to this performance activity.

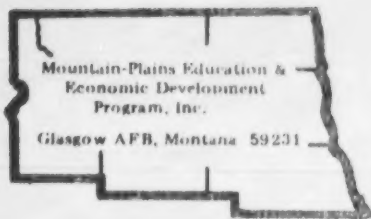
RESOURCES:

AC Circuits, An Individualized Approach to Electronics (booklet - Unit 8: Parallel Resistive-Reactive Circuits--), student handbook), Trejo.

PROCEDURE:

1. Read pages 19-27, Unit 8 in AC Circuits.
2. Answer questions within the chapter.
3. Proceed to the next LAP.

Principal Author(s): P. Schuster, B. Vetter



File Code: 77.02.08.03.A2-0

Date Published: 11/14/75

Learning Activity Package

Participant: _____

Date: _____

PERFORMANCE ACTIVITY: Parallel RC and RLC Circuits

OBJECTIVE:

Calculate the current, impedance, power and power factor for parallel RC and RLC circuits.

EVALUATION PROCEDURE:

Student is to score at least 80% on the unit test for questions pertaining to this performance activity.

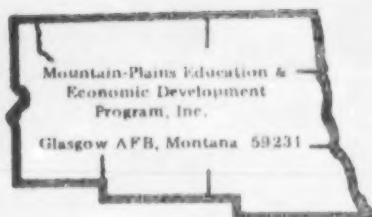
RESOURCES:

AC Circuits, An Individualized Approach to Electronics (booklet - Unit 8: Parallel Resistive-Reactive Circuits--, student handbook), Trejo.

PROCEDURE:

1. Read pages 29-39, Unit 8 in AC Circuits.
2. Answer questions within the chapter.
3. Proceed to next LAP.

Principal Author(s): P. Schuster, B. Vetter



File Code: 77,02,08,04.A2-0

Date Published: 11/14/75

Learning Activity Package

Participant: _____

Date: _____

PERFORMANCE ACTIVITY: Parallel Resonance

OBJECTIVES:

Identify the characteristics of a tank circuit .

Diagram current and impedance curves for parallel circuits at resonant frequency.

Identify parallel resonant circuit behavior above and below the resonant frequency.

EVALUATION PROCEDURE:

Student is to score at least 80% on the unit test for questions pertaining to this performance activity.

RESOURCES:

AC Circuits, An Individualized Approach to Electronics (booklet - Unit 8: Parallel Resistive-Reactive Circuits--, student handbook), Trejo.

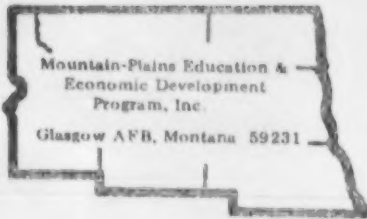
PROCEDURE:

1. Read pages 40-57, Unit 8, AC Circuits.
2. Answer questions within the chapter.
3. Proceed to the next LAP.

Principal Author(s): P. Schuster, B. Vetter

File Code: 77.02.08.05.A2-0

Date Published: 11/14/75



Learning Activity Package

Student: _____

Date: _____

PERFORMANCE ACTIVITY: Practical RL Circuits

OBJECTIVES:

Explain how parallel resonant circuits are used as filters.

Explain effective resistance of a coil in a parallel RL circuit.

Calculate figure of merit (Q), impedance and current in a practical parallel RL circuit.

EVALUATION PROCEDURE:

Student is to score at least 80% on the unit test for questions pertaining to this performance activity.

RESOURCES:

AC Circuits, An Individualized Approach to Electronics (booklet - Unit 8: Parallel Resistive-Reactive Circuits--), student handbook, progress tests), Trejo.

PROCEDURE:

1. Read pages 58-70, Unit 8 in AC Circuits.
2. Answer questions within the chapter.
3. Take the Unit Progress Test.

Principal Author(s):

P. Schuster, B. Vetter